NOTICE

All drawings located at the end of the document.

1 INTRODUCTION

The purpose of this Sampling and Analysis Plan (SAP) is to direct the collection of soil samples in the North Walnut Creek drainage This activity supports the field evaluations in and around the area of the Solar Ponds Plume and the Interceptor Trench System This specific task will provide preliminary information regarding soil types, soil chemistry and physical characteristics The objective of this SAP is to describe the specific data needs, sampling and analysis requirements, data handling procedures, and associated Quality Assurance/Quality Control (QA/QC) requirements for this investigation All work will be performed in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS 1997a)

1 1 Background

The area of the Solar Ponds Plume (SPP) is known to be contaminated with high levels of nitrate and some uranium due to past waste storage practices in the Solar Evaporation Ponds Other contaminants have been found in the Solar Ponds Plume area in the past, but on-going data evaluations and groundwater monitoring show levels of contaminants other than nitrate to be generally consistent with background levels established for the Site Currently, groundwater from the Solar Ponds Plume is collected in the Interceptor Trench System (ITS) and stored in the Modular Storage Tanks (MSTs) prior to treatment in the Site's process waste facility, Building 374 An alternative to the current treatment method is being sought

The recently-completed alternatives evaluation (RMRS 1997b) identified the four most cost-effective alternatives for addressing the SPP contamination One of these alternatives is phytoremediation, the use of deep rooted perennial plants to remove contaminants *in situ* Plants use nitrate as a nutrient This process is sufficiently well understood to allow the development of engineering specifications to appropriately size a phytoremediation system which can remove the excess nitrate levels found in SPP groundwater However, additional information regarding the agronomic condition of the soils is needed to fully evaluate the use of phytoremediation in this area

2 1 Sampling of Soils

Soil will be sampled from columnar cores drilled to a depth of eight (8) feet, this depth represents the potential planting depth for young saplings (called "whips") Cores will be collected using the four-wheel drive van-mounted GeoProbe equipment Field deployment of the GeoProbe requires the development of a work plan, and a health and safety plan, as well as acquisition of soil disturbance permits, and other steps which are outside the scope of this document These documents and permits will be submitted for review under separate cover

GeoProbe coring procedures include a descriptive log of the core as it is collected The cores will be managed so as to preserve the columnar integrity Soil samples will be collected from the removed cores at representative depths For purposes of this plan, a minimum of three samples per core shall be collected 0 to 2 feet, 2 to 6 feet, and 6 to 8 feet The remainder of the cores shall be preserved for future sample collection, if needed

In the event that the GeoProbe equipment is not available or cannot safely be deployed in the proposed sampling area, an alternative method of soil sampling will be used In this case, a bucket auger or a push-tube sampler may be substituted Stainless steel sampling equipment will be used, if available

If conditions are encountered in the field which make the use of a procedure unsafe or inappropriate for the task at hand, the specified procedures may be modified or replaced as long as the modification or replacement procedure is justified and detailed in the field logbook and the resulting data is comparable and adequate to meet the objectives of the project

which are oriented to match the current knowledge of plume location Transect A traverses about 900 feet of the plume area, including an area of higher nitrate concentration in the center A minimum of five locations shall be cored along this transect Transect B traverses about 275 feet of the plume area and is centered in the area of higher nitrate concentration A minimum of three locations shall be cored along this transect The central coring location will be at the intersection of the two transects, for a total of seven coring locations Coring locations shall be selected to coincide with these lines as closely as possible, although specific conditions (such as slope or accessibility) may require some deviation from the designated position An alternative site may be selected, as long as the conditions requiring the deviation are properly recorded and the exact position of the coring is recorded Coordinates for each coring location shall be determined using geographic positioning system (GPS) equipment Ashtech GPS and Prism Software Instruction Manuals will be used as guidance documents for the collection of GPS data

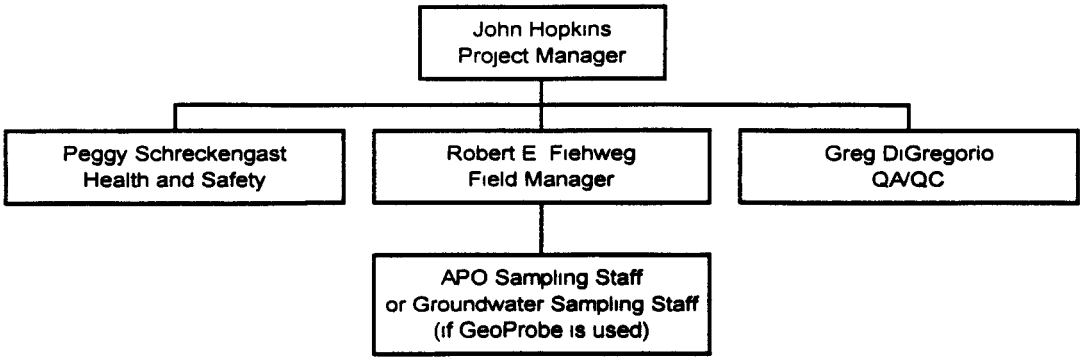
3. SOIL ANALYSES

The analytical requirements for the samples to be collected under this SAP are described in Table 1, including special sample handling requirements Samples will be handled in accordance with FO 10 Receiving, Labeling, and Handling Environmental Material Containers, and recommendations by the selected analytical laboratory Soil analyses shall be in accordance with the Standard Soil Tests as described in the current edition of Methods of Soil Analysis (Page 1982)

4. DATA MANAGEMENT

A field logbook (ER-LB-97-330) will be used during this investigation by both field sampling personnel and RMRS technical staff Entries in the logbook will identify specific coring locations, the core number, the number and types of samples collected from each core per location, and the time and date of field activities Soil samples may be collected from the cores at a location other

Figure 2 ITS Investigation Organization



6. REFERENCES

Page, A L , Editor 1982 *Methods of Soil Analyses, Parts I and II*, Am Soc of Agronomy, Inc and Soil Science Soc of America, Inc

RMRS, 1997a, *RMRS Quality Assurance Program Description*, RMRS-QAPD-001, Rev 1, January

RMRS, 1997b, *Solar Ponds Plume Remediation and Interceptor Trench System Water Treatment Study*, RF/RMRS-97-093 UN, September, 1997

Approvals

12/18/97

John Hopkins Date

12/12/97

Greg Digregorio Date

than the field if necessary The field crew will complete a chain-of-custody form recording the sample number, location, time of collection, analyses requested, and sampler's signature One copy of the chain-of-custody record will be retained by the samplers and the original will accompany the samples to the laboratory

4 1 Project Completion

The results will be compiled and placed in the project files At the end of the project, all records and field documentation will be turned over to the records center

4 2 Quality Assurance

Analytical data collected in support of this investigation will be evaluated using the guidance established by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08 02 Evaluation of ERM Data for Usability in Final Reports This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability parameters Because the objective of this sampling effort is to establish whether the area of the nitrate plume is suitable for the growth of candidate species in a phytoremediation installation, the analytical results should meet standard agronomic requirements (Page 1982)

5. PROJECT ORGANIZATION

The project organization chart is presented in Figure 2 The ER Projects Group is responsible for management and coordination of resources dedicated to the project Other organizations assisting with the implementation of this project are RMRS Program Compliance, RMRS Health and Safety, and RMRS Quality Assurance

2. PROJECT AND DATA QUALITY OBJECTIVES

The objective of this SAP is to set forth the steps that will be taken to identify appropriate sampling locations, collect soil samples, and convey the samples to the selected analytical laboratory for analysis The samples will be evaluated, as indicated below, for those parameters necessary to determine the feasibility of a phytoremediation project and to provide preliminary design inputs Data requirements to support this project were developed from a review of literature sources and consultation with experts in agronomy, plant biochemistry and phytoremediation

Analytical requirements include soil texture (both field and lab methods), standard soil tests (organic matter, pH, electrical conductivity and cation exchange capacity), available nutrients (phosphorus [P], potassium [K], nitrogen species [TKN, NO_2/NO_3, NH_3], sulfur [S], magnesium [Mg], calcium [Ca], sodium [Na], iron [Fe], aluminum [Al], manganese [Mn], copper [Cu], and zinc [Zn]) and Uranium [U]

Table 1. Analytical Requirements

Analysis Method	Number of Field Samples	Number of QC Samples	Total Number Samples	Containers, Preservatives, Holding Times
Available Soil Nutrients	21	2 duplicates (1 per 20 samples)	23	ZipLoc Bags (or Lab-supplied containers), no preservatives but hold at 4° C, 3 months, and screen for radionuclides before shipment off-site
Soil Texture (Field and lab)	5		5	
Standard Soil Test	21		23	
Uranium	21		23	

Samples will be collected in the area of the Interceptor Trench System outside of the Perimeter Intrusion Detection and Assessment System (PIDAS), in transects oriented approximately northwest-southeast and northeast-southwest Transects are described below

The following procedures apply to this soil sampling activity

FO 3	Field Decontamination Operations
FO 06	Handling of Personal Protective Equipment
FO 07	Handling of Decontamination Water and Wash Water
FO 10	Receiving, Marking and Labeling of Environmental Materials Containers
FO 13	Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples
GT 01	Logging of Alluvial and Bedrock Materials
GT 05	Plugging and Abandonment of Boreholes
GT 10	Borehole Clearing
GT 17	Land Surveying
GT 39	Push Subsurface Soil Sample
ADM 8 02	Evaluation of ERM Data for Usability in Final Reports
ADM 8 05	Use of Field Logbooks and Forms

2 2 Compositing of Samples

Soil samples collected at equal depths from multiple coring locations may be composited to generate representative data from fewer samples The sampling logs from the cores will be evaluated and compared to identify discernible soil horizons If discernible soil horizons can be identified between locations, samples from any or all of the coring locations along the transect may be composited into a single sample for analysis

2 3 Sampling Sites and Transect Location

Two transects shall be sampled One (Transect A) trending northwest-southeast through the northern edge of the ITS, and one trending northeast-southwest (Transect B) located approximately in the center of and perpendicular to Transect A Figure 1 shows the approximate location of the transects

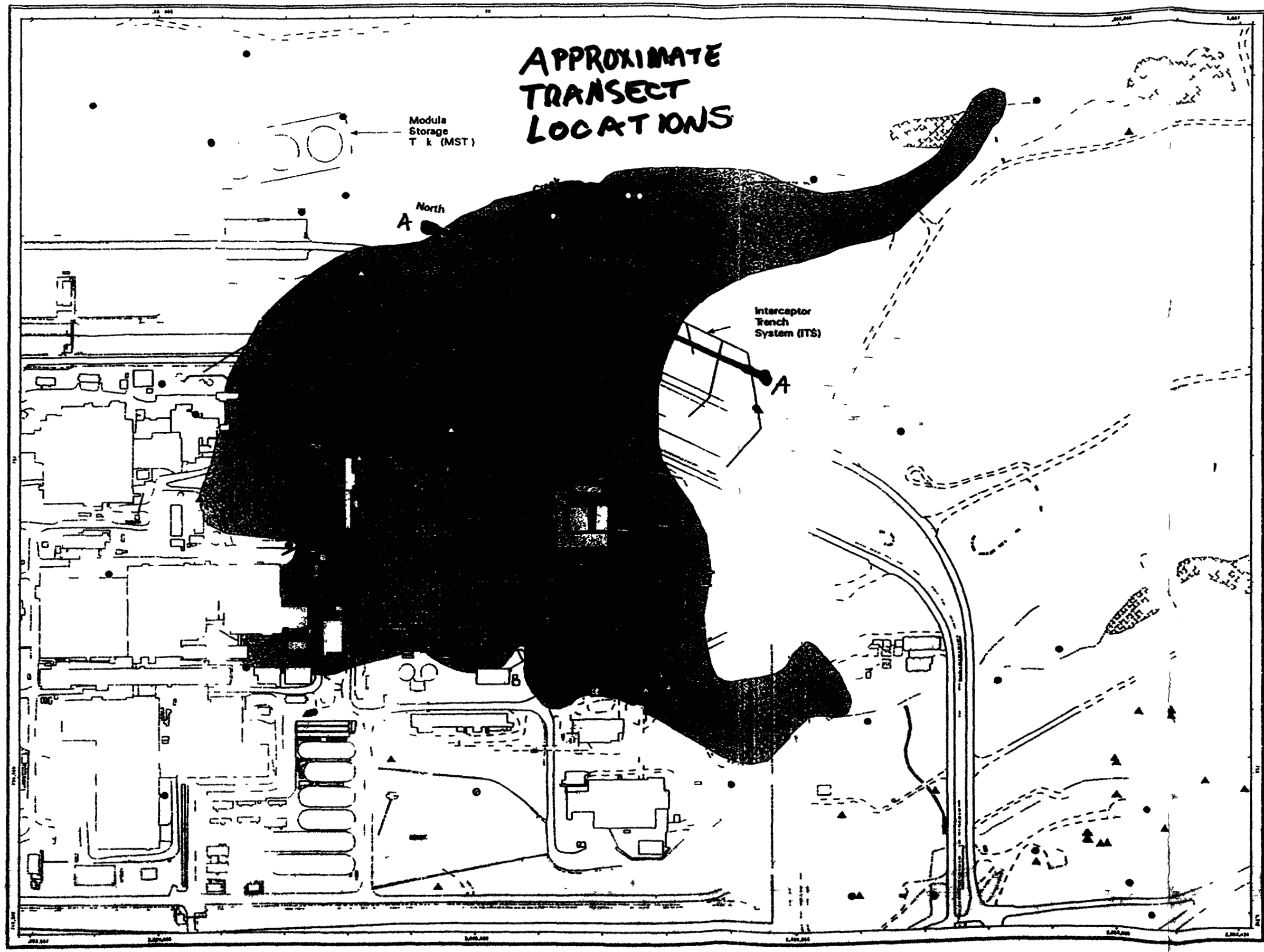


Figure 1
Selected Nitrate Plumes
(Nitrate Standard and 100 x Standard)

EXPLANATION

100 Nitrate Standard (1000 mg/l)

Nitrate Standard (10 mg/l)

Nitrate Concentration (mg/l) (1991-95)

- 0 4.66
- 4.66 10
- 10 100
- 100 1000
- 1000

Alluvium Wells

Bedrock Wells

Standard Map Features

Buildings or other structures

Solar evaporation ponds

Lakes and ponds

Streams, ditches, or other drainage features

Fences

Rocky Flats boundary

Paved roads

Dirt roads

Scale 3780
Inch represents approximately feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD2

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by
RMRS Rocky Mountain Remediation Services, L.L.C.

MAP ID: 97-0138

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